

6 Summary

Postoperative malrotation of the femur is a frequent complication in the treatment of femur fractures by intramedullary nailing. The intraoperative adjustment of the fragments in the transversal plane is difficult and mostly based on rating methods.

The aim of the new Trochanter-Minor-Method (TMM) is to reduce the incidence of this complication. The following questions have been examined in an experimental study in order to prove this hypothesis

- 1) Can clinically relevant contralateral differences ($> 15^\circ$) in femoral anteversion angles be detected by comparing the contralateral lesser trochanter shape signs in fluoroscopic images?
- 2) What are the values for intra- and interobserver variability?

To investigate the TMM, an experimental study on 27 paired human cadaver femurs with an average age of 75,5 years (51 to 99 years) has been conducted. Femurs with healed fractures or implants have been excluded.

The anteversion angles of the femurs have been measured by two well accepted computertomographic methods (Jend and Waidelich). Based on this data, the anteversion difference for each pair of femurs has been calculated.

The measurements of anteversion differences using the TMM have been carried out with a construction that has specifically been built for this purpose.

This construction enabled for adjustment and fixation of the femurs on the plane of the dorsal line of their condyles. The proximal ends of the bones have then been observed with a radiographic image intensifier. The left femur has then been rotated against the fixed contralateral side until the radiographic shape signs of both femurs have been congruent.

The angle of this rotation was defined as the TMM-anteversion-difference. A scale on the construction showed the value in degrees.

Three observers have been examining all bones with each of the three methods. One of the observers had no experience with the TMM. After two weeks all experiments have been repeated by the same group again.

The analysis of variance showed no significant differences for the factor „method“ nor for the factor „observer“ (significance $> 0,05$). The factor bone pair showed a significant accidentally interaction with the factor method (significance $< 0,05$). Although differences

between the methods could be determined, the direction of the individual deviation of the values within the TMM varies from bone pair to bone pair.

This outcome raises the hypothesis that the individual anatomical nature of the femora might have significantly influenced the obtained values.

The comparison of the estimation of variance components shows that both, inter- and intraobserver variability are smaller for the CT-based methods than for the TMM.

However, the accuracy of anteversion difference measurements using TMM has been within the clinically important range of $\pm 15^\circ$. This result has even been achieved by the observer, who was unexperienced in the use of TMM.

The experimental study demonstrates that the TMM is suitable for the minimization of contralateral anteversion difference of the femur. Additional studies are necessary to determine the benefits of this technique in a clinical setting.